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(दूसरा पुनरीक्षण)

Luminaires

Part 5 Particular Requirements

Section 7 Lighting Chains

(Second Revision)

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NATIONAL FOREWORD

This Indian Standard (Part 5/Sec 7) (Second Revision) which is identical to IEC 60598-2-20 : 2022 'Luminaires — Part 2-20: Particular requirements — Lighting chains' issued by the International Electrotechnical Commission (IEC) was adopted by the Bureau of Indian Standards on the recommendation of the Illumination Engineering and luminaires Sectional Committee and approval of the Electrotechnical Division Council.

This standard was first published in year 2013 and subsequently revised in 2017 to align it with the IEC 60598-2-20 : 2014. This revision has been brought out to align it with the IEC 60598-2-20 : 2022.

This revision includes the following significant technical changes with respect to the previous version:

- a) Specific provisions for Temporarily Installed Protected Lighting (TPL) chains have been added;
- b) New terms and definitions have been added; and
- c) References to IS 10322 (Part 1) have been updated

This standard covers requirements for lighting chains fitted with series, parallel or a combination of series/parallel connected light sources for use either indoors or outdoors on supply voltages not exceeding 250 V.

This standard (Part 5/Sec 7) is one among the series of Indian Standards which deals with luminaires. The other parts and sections are as follows:

Part 1	General requirements
Part 5	Particular requirements,
Sec 1	Fixed general purpose luminaires
Sec 2	Recessed luminaires
Sec 3	Luminaires for road and street lighting
Sec 4	Portable general purpose luminaires
Sec 5	Flood lights
Sec 6	Handlamps
Sec 8	Luminaires for emergency lighting
Sec 18	Luminaires for swimming pools and similar applications

This standard is to be read in conjunction with IS 10322 (Part 1) 'Luminaires: Part 1 General requirements'. For the sake of convenience, the clauses of this standard correspond to those of IS 10322 (Part 1), instead of reproducing full text of each clause; reference to relevant clauses of IS 10322 (Part 1) has been given.

The text of the IEC standard has been approved as suitable for publication as an Indian Standard without deviations. Certain conventions are, however, not identical to those used in Indian Standards. Attention is particularly drawn to the following:

- a) Wherever the words 'International Standard' appears referring to this standard, they should be read as 'Indian Standard'; and
- b) Comma (,) has been used as a decimal marker, while in Indian Standards the current practice is to use a point (.) as the decimal marker.

[\(Continued on third cover\)](#)

CONTENTS

INTRODUCTION.....	v
20.1 Scope.....	1
20.2 Normative references	1
20.3 Terms and definitions	2
20.4 General test requirements	4
20.5 Classification of luminaires	4
20.5.1 General	4
20.5.2 Protection against electric shock	4
20.5.3 Protection against dust, solid objects and moisture	4
20.6 Marking	4
20.6.1 General	4
20.6.2 Lighting chain marking	5
20.6.3 Lighting chain and packaging marking	5
20.6.4 Packaging or instructions marking	5
20.7 Construction	6
20.7.1 General	6
20.7.2 Lampholders	6
20.7.3 Terminal blocks	6
20.7.4 Terminals and supply connections	7
20.7.5 Gaskets	7
20.7.6 Mechanical strength	7
20.7.7 Lamp bridging devices	7
20.7.8 Control units and controlgear	7
20.7.9 Lamp rotation	8
20.7.10 Lamp insertion and withdrawal force	8
20.7.11 Lamp mechanical requirements	8
20.7.12 Temporarily installed protected lighting (TPL) chains	8
20.8 Creepage distances and clearances	9
20.9 Provisions for earthing	9
20.10 Terminals	9
20.11 External and internal wiring	9
20.11.1 General	9
20.11.2 Cables for lighting chains	9
20.11.3 Cord anchorage test	10
20.11.4 Plugs and cable length	10
20.11.5 Maximum length of extendable class II lighting chains	10
20.12 Protection against electric shock	11
20.12.1 General	11
20.12.2 Divisible plug	11
20.12.3 Electrification of decorations	11
20.12.4 Contacts of push-in lampholders	12
20.12.5 Blanking plugs	12
20.13 Endurance tests and thermal tests	13
20.13.1 General	13

20.13.2	Test voltage	13
20.13.3	Lamp bridging devices.....	13
20.13.4	Short-circuit test of rectifier	13
20.14	Resistance to dust, solid objects and moisture	13
20.15	Insulation resistance and electric strength	14
20.16	Resistance to heat, fire and tracking.....	14
Annex A (normative) Requirements for interconnecting connectors for use in lighting chains.....		15
Bibliography.....		17
Figure 1 – Examples of different types of lighting chains.....		4
Figure 2 – Example of a connector to a divisible plug for lighting chains		11
Figure 3 – Example of test device suitable for checking security of lampholder contacts		12
Table 1 – Cable or cord types for lighting chains.....		9
Table 2 – Conductor size for lighting chains.....		10

INTRODUCTION

This new edition includes the following technical changes:

- a) Inclusion of specific provisions for temporarily installed protected lighting (TPL) chains.

This form of lighting chain was not previously addressed with specific provisions in previous editions of the standard. A temporarily installed protected lighting chain is a physical impact protected rough service lighting chain intended for temporary installation on building sites during the construction or demolition phases of a building project.

- b) Addition of terms and definitions

New terms and definitions have been added to include the expanded typology for lighting chains and to include a connector with breaking capacity (CBC).

- c) Inclusion of graphical depictions of lighting chains

Graphical depictions have been added to clarify and differentiate the construction and installation configurations of the various different types of lighting chains. Word descriptions alone had limitations in clearly and precisely defining the characteristics of the numerous variants in this luminaire sector.

The illustrations show the three main types of lighting chains: permanently installed lighting chains, temporarily installed lighting chains and temporarily installed protected lighting (TPL) chains, as well as further differentiating by installation and/or fixing method where applicable.

Indian Standard

LUMINAIRES

PART 5 PARTICULAR REQUIREMENTS

SECTION 7 LIGHTING CHAINS

(Second Revision)

20.1 Scope

This part of IEC 60598 specifies requirements for lighting chains fitted with series, parallel or a combination of series/parallel connected light sources for use either indoors or outdoors on supply voltages not exceeding 250 V.

For combinations where rope lights (also known as sealed lighting chains) are included, see IEC 60598-2-21.

Lighting chains provided with fixed or detachable attachments for example ornamental or decorative, are considered to be covered by this document.

For lighting chains fitted with lampholders of the push-in type, the appropriate requirements of this document applies.

This document covers the following lighting chains:

- a) permanently installed lighting chains;
- b) temporarily installed lighting chains;
- c) temporarily installed protected lighting (TPL) chains.

NOTE 1 Festoon lighting chain – a lighting chain that is supported by the supply cable or fixed at the lampholder and is permanently connected to the fixed wiring. Festoon lighting chains are primarily suitable for permanent indoor or outdoor lighting applications.

NOTE 2 Decorative lighting chain – a lighting chain that is supported by the supply cable and is temporarily connected to the fixed wiring. Decorative lighting chains are primarily suitable for domestic, indoor or indoor/outdoor temporary lighting applications, see Figure 1 for examples.

NOTE 3 Temporarily installed protected lighting (TPL) chain – a lighting chain where each lampholder is fixed to the building or structure and the light source is enclosed by a protective enclosure and is temporarily connected to the fixed wiring. Temporarily installed protected lighting chains are primarily suitable for use in rough service lighting applications.

For lighting chains with non-standardized lamps (e.g. lamps of the push-in type) the lamps are regarded as a part of the lighting chain and consequently included in the testing.

NOTE 4 For products where the lighting chain is permanently fixed to a frame or pre-lit Christmas tree the relevant clauses of IEC 60598-2-4 can also apply.

NOTE 5 In some countries the term "strings" is used instead of "chains".

NOTE 6 Candlestick luminaires are tested according to IEC 60598-2-4.

20.2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60227-5:2011, *Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – Part 5: Flexible cables (cords)*

IEC 60238:2016, *Edison screw lampholders*
IEC 60238:2016/AMD1:2017
IEC 60238:2016/AMD2:2020

IEC 60309-1, *Plugs, socket-outlets and couplers for industrial purposes – Part 1: General requirements*

IEC 60320 (all parts), *Appliance couplers for household and similar general purposes*

IEC 60529, *Degrees of protection provided by enclosures (IP Code)*

IEC 60598-1, *Luminaires – Part 1: General requirements and tests*

IEC 60906 (all parts), *IEC system of plugs and socket-outlets for household and similar purposes*

IEC 61184:2017, *Bayonet lampholders*
IEC 61184:2017/AMD1:2019

IEC 61347-2-11, *Lamp controlgear – Part 2-11: Particular requirements for miscellaneous electronic circuits used with luminaires*

IEC 61347-2-13, *Lamp controlgear – Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules*

IEC 61984:2008, *Connectors – Safety requirements and tests*

ISO 4046-4:2016, *Paper, board, pulps and related terms – Vocabulary – Part 4: Paper and board grades and converted products*

20.3 Terms and definitions

For the purpose of this document, the terms and definitions given in IEC 60598-1 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

20.3.1

lighting chain

luminaire comprising an assembly of series-connected lamps, parallel-connected lamps or series/parallel-connected lamps and interconnecting insulated conductors

Note 1 to entry: For lighting chains with non-standardized lamps (e.g. lamps of the push-in type) the lamps are regarded as part of the chain.

Note 2 to entry: For lighting chains with non-removable lamps, the lamps are regarded as part of the chain.

Note 3 to entry: A lighting chain may incorporate control devices (e.g. flasher units, see 20.7.8).

Note 4 to entry: Unless otherwise stated, references to lamps within this document also refer to LEDs.

20.3.2

rope light

sealed lighting chain

lighting chain with non-replaceable light sources enclosed in a rigid or flexible insulating translucent pipe or tube, sealed at the ends, with or without joints

Note 1 to entry: Rope lights are covered by IEC 60598-2-21.

20.3.3

connector with breaking capacity

CBC

connector specially designed to be engaged or disengaged in normal use when live or under load

[SOURCE: IEC 60050-581:2008, 581-27-72]

20.3.4

permanently installed lighting chain

lighting chain that is supported by the supply cable or attached at the lampholder and is permanently connected to the fixed wiring

EXAMPLE Lighting chain for illuminating ski-tracks or promenades.

Note 1 to entry: Permanently installed lighting chains are primarily suitable for permanently installed indoor or outdoor lighting applications, see Figure 1 a) for examples.

Note 2 to entry: In some countries permanently installed lighting chains are called festoon lighting chains.

20.3.5

temporarily installed lighting chain

lighting chain that is supported by the supply cable and is temporarily connected to the fixed wiring

EXAMPLE Christmas tree lighting chain.

Note 1 to entry: Temporarily installed lighting chains are suitable for domestic, indoor or indoor/outdoor temporarily installed lighting applications, see Figure 1 b) for examples.

Note 2 to entry: In some countries temporarily installed lighting chains are called decorative lighting chains.

20.3.6

temporarily installed protected lighting (TPL) chain

lighting chain where each lampholder is attached to the building or structure and the light source is enclosed by a protective enclosure and is temporarily connected to the fixed wiring

EXAMPLE Construction site lighting chain.

Note 1 to entry: Temporarily installed protected lighting chains are primarily suitable for use in rough service lighting applications, see Figure 1 c) for example.

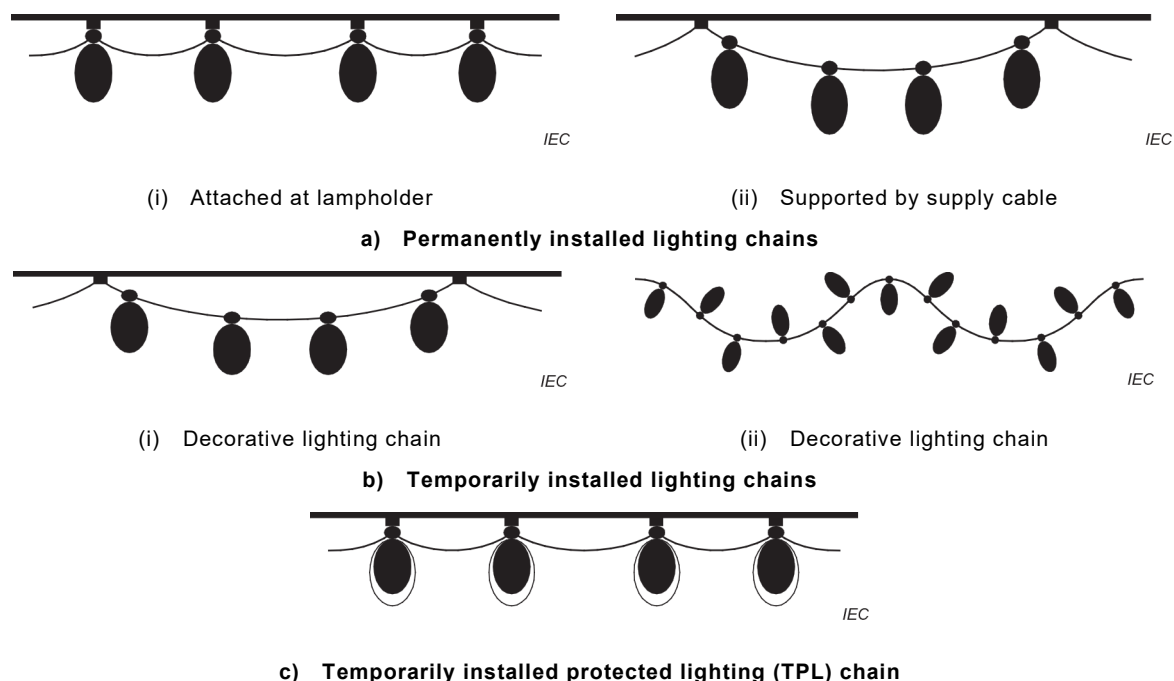


Figure 1 – Examples of different types of lighting chains

20.4 General test requirements

The provisions of Section 0 of Part 1 apply. The tests described in each appropriate section of Part 1 shall be carried out in the order listed in this document.

20.5 Classification of luminaires

20.5.1 General

Lighting chains shall be classified in accordance with the provisions of Section 2 of Part 1 together with the requirements of 20.5.2 and 20.5.3.

20.5.2 Protection against electric shock

Lighting chains shall be classified as Class II or Class III.

20.5.3 Protection against dust, solid objects and moisture

Lighting chains for outdoor use shall have a protective index IP 44 or higher.

20.6 Marking

20.6.1 General

The provisions of Section 3 of Part 1 apply together with the requirements of 20.6.2 to 20.6.4.

20.6.2 Lighting chain marking

The following information shall be marked on the lighting chain:

- rated voltage of the complete chain;
- rated wattage of the complete chain.

Where the information is on the cable, it shall be marked on a durable non-removable sleeve or label.

20.6.3 Lighting chain and packaging marking

The following marking shall be placed on the lighting chain and on the accompanying packaging of lighting chains for indoor use only.

- "FOR INDOOR USE ONLY".
- As an alternative to the text, the lighting chain can be marked with the symbol IEC 60417-5957 (2004-12). The symbol shall be explained in the instructions.

NOTE In some countries (UK and Australia) national requirements are such that a plug must be fitted to a portable appliance. In situations where this plug does not provide the same ingress protection of the lighting chain, information concerning the location of the plug/transformer may be given e.g. "Plug/transformer for indoor use only".

20.6.4 Packaging or instructions marking

The following or similar marking shall be placed on the accompanying packaging or instructions.

- For all lighting chains where the packaging has not been adapted for display purposes:
 - "Do not connect the chain to the supply while it is in the packaging".
- For lighting chains with replaceable lamps:
 - voltage and wattage or manufacturer's article number of replacement lamps;
 - "Do not remove or insert lamps while the chain is connected to the supply";
 - "Ensure that all lampholders are fitted with a lamp".
- Lighting chains designed to be used without a lamp in every lampholder:
 - adequate information about required blanking plug(s).
- For chains with replaceable series-connected lamps:
 - "Replace failed lamps immediately by lamps of the same type as delivered or of a type specified by the manufacturer".
- For lighting chains with 'fuse' lamp(s):
 - "Do not replace a 'fuse' lamp with a non-'fuse' lamp"; in order to indicate the difference from 'ordinary' lamps, 'fuse' lamps shall be partly coloured white;
 - information indicating that the chain is provided with 'fuse' lamps and explanation of their function.
- For lighting chains with non-replaceable lamps:
 - "The lamps are not replaceable".
- For class II lighting chains with non-replaceable lamps, the substance of the following:
 - where breakage or damage to lamps occurs the chain must not be used or energized but disposed of safely.
- For lighting chains which rely on gaskets to provide the specified degree of protection against dust, solid objects and moisture:
 - "WARNING – THIS LIGHTING CHAIN MUST NOT BE USED WITHOUT ALL GASKETS BEING IN PLACE."

- i) For lighting chains intended for interconnection:
 - "Do not interconnect parts of this lighting chain with parts of another manufacturer's lighting chain";
 - "Interconnection shall be made only by the use of the supplied connectors. Any open ends must be sealed-off before use";
 - maximum system length that may be interconnected;
 - maximum number of lamps or maximum system wattage that may be interconnected.
- j) For lighting chains incorporating lamp bridging device(s):
 - information stating that the chain is fitted with a bridging device(s).
- k) For class III lighting chains delivered without a supply source:
 - relevant information concerning the required supply source.
- l) For mains voltage lighting chains with series connected lamps:
 - "WARNING – RISK OF ELECTRIC SHOCK IF LAMPS ARE BROKEN OR MISSING. DO NOT USE."

20.7 Construction

20.7.1 General

The provisions of Section 4 of Part 1 apply together with the requirements of 20.7.1 to 20.7.12.

Temporarily installed protected lighting (TPL) chains shall comply with the requirements for rough service luminaires as defined in Part 1.

20.7.2 Lampholders

In lighting chains where non-standardized lampholders (e.g. of the push-in type) are used, the lampholders are regarded as parts of the lighting chain and tested accordingly.

Edison screw lampholders E5, E10, E14 and E27 shall meet the requirements of IEC 60238.

Bayonet lampholders shall meet the requirements of IEC 61184.

Insulation piercing terminals on lampholders are acceptable only if used in the SELV circuit of lighting chains or as permanent, non-rewireable connections in class II chains.

E5 and E10 lampholders and similar small lampholders of the push-in type shall be used only if the rated voltage of each lamp does not exceed:

- | | |
|--|-------|
| – for E5 and similar small lampholders | 25 V |
| – for series connected E10 lampholders | 60 V |
| – for parallel connected E10 lampholders | 250 V |

Compliance is checked by inspection.

Lampholders shall have a body of insulating material.

Compliance is checked by inspection.

20.7.3 Terminal blocks

Clause 4.6 of Part 1 referring to terminal blocks does not apply.

20.7.4 Terminals and supply connections

Clause 4.7 of Part 1 referring to terminals and supply connections applies together with the following requirement.

Interconnecting connectors for lighting chains shall, in addition, comply with the requirements and modifications given in Annex A.

Plugs and socket-outlets used with temporarily installed protected lighting (TPL) chains shall conform to IEC 60309-1.

Compliance is checked by inspection and by carrying out the tests of this document.

20.7.5 Gaskets

Gaskets used to provide the specified degree of protection against dust, solid objects and moisture of lighting chains for outdoor use shall be weather resistant. Such gaskets shall remain in place on the chain when the lamp is removed and shall fit tightly round the inserted lamp.

Compliance is checked by inspection and by manual test.

NOTE A test to verify the weather resistance of gaskets is under consideration.

20.7.6 Mechanical strength

The mechanical strength requirements of Clause 4.13 of Part 1 for Edison screw lampholders and small lampholders of the push-in type shall be checked by the tests given in Clause 16 of IEC 60238:2016. The free fall test specified for E5 and E10 lampholders shall also apply for push-in lampholders.

For bayonet lampholders, the tests in Clause 16 of IEC 61184:2017 apply.

The tests are made on three samples of the lampholder without the lamp inserted. After the test, the relevant compliance requirements of Clause 4.13 of Part 1 shall be met.

Accessories, for example plugs, interconnecting connectors, incorporated in a lighting chain, shall comply with the mechanical requirements of 4.13.6 of Part 1.

20.7.7 Lamp bridging devices

Protection against electric shock and fire shall not be impaired when devices for bridging lamp filaments in series connected chains are functioning.

Compliance is checked by inspection and, where appropriate, by the test of 20.13.3.

20.7.8 Control units and controlgear

Control units and similar devices forming an integral part of the lighting chain shall be enclosed in non-flammable insulating material. In addition they shall be securely fixed to the cable of the chain.

Compliance is checked by inspection and, for the non-flammability of the insulating material, by the tests of Clause 20.16.

Any electronic control unit (e.g. flasher units) shall, in addition to the requirements of this document, comply with the requirements of IEC 61347-2-11.

LED controlgear shall comply with the requirements of IEC 61347-2-13.

Compliance is checked by carrying out the relevant tests.

The enclosure of electronic control units shall meet the mechanical impact requirements of Part 1 using an impact energy of 0,7 Nm unless marked for indoor use only, where an impact energy of 0,5 Nm is applied.

20.7.9 Lamp rotation

The lamp (bulb) glass of push-in lamps shall not rotate in relation to the lamp cap, if any, and the lamp cap, if any, shall not rotate in relation to the lampholder.

Compliance is checked by applying a torque of 0,025 Nm for 1 min between the glass envelope and the lampholder. No displacement shall occur between the parts during the test.

20.7.10 Lamp insertion and withdrawal force

Replaceable push-in type lamps shall remain in the seated position when the lamp is subjected to a pull force of up to 3 N. Replaceable push-in type lamps shall make electrical contact with the lampholder contacts by applying a push-in force of up to 3 N. Withdrawal of the lamp from the holder shall be effected when subjected to a pull force of between 3 N and 10 N.

Non-replaceable lamps shall withstand a pull force of $10\text{ N} \pm 1\text{ N}$ during which the lamp shall remain seated and shall not have become unsafe.

During each application of the specified forces no damage shall occur impairing safety and in particular no breakage or separation of the lamp glass envelope from the lamp cap shall take place.

Compliance is checked on three new samples, by manual test, by measurement of the forces and by inspection.

The samples are then placed in an oven at a temperature of $120\text{ °C} \pm 5\text{ K}$ for 2 h, following which it is allowed to cool down to room temperature. During this test, lampholders for replaceable lamps are left empty.

The same three samples are then re-submitted to the same tests, requirements and compliance criteria as those specified for the sample before the heating treatment. For lampholders for replaceable lamps, the lamps are reintroduced by a push-in force of $5\text{ N} \pm 1\text{ N}$.

20.7.11 Lamp mechanical requirements

Other than lamps supplied by SELV, the lamps of lighting chains shall be resistant to typical handling forces.

The bulb (envelope) of the following lamps shall be included in the mechanical test:

- non-removable lamps,
- non-standardized lamps.

Compliance is checked by the test of 4.13.1 of Part 1 using an impact energy of 0,2 Nm and with the lamp held against a suitable rigid wooden board.

20.7.12 Temporarily installed protected lighting (TPL) chains

Temporarily installed protected lighting (TPL) chains shall comply with constructional requirements for rough service luminaires given in Part 1.

20.8 Creepage distances and clearances

The provisions of Section 11 of Part 1 apply.

20.9 Provisions for earthing

The provisions of Section 7 of Part 1 do not apply.

20.10 Terminals

The provisions of Sections 14 and 15 of Part 1 apply.

20.11 External and internal wiring

20.11.1 General

The provisions of Section 5 of Part 1 apply together with the requirements of 20.11.2 to 20.11.4.

20.11.2 Cables for lighting chains

Subclause 5.2.2 of Part 1 is replaced by the following.

Internal and external cables for lighting chains shall at least be equal in their mechanical and electrical properties to those given in Table 1 and Table 2:

Table 1 – Cable or cord types for lighting chains

Type of lighting chain	Required cable or cord type
Class II ordinary lighting chains	60227 IEC 52 ^a or 60227 IEC 43
Class II lighting chains other than ordinary	60245 IEC 57 ^a
Class III lighting chains and parts of chains supplied by SELV	Insulation according to 5.3.1 of Part 1 ^b
Temporarily installed protected lighting (TPL) chains	Elastomer or thermoplastic sheathed flexible conductors or flexible cables (or cords) conforming to IEC 60227-5
^a The cable may consist of a single core cable provided with a two-layer insulation corresponding to the specified standard sheet.	
^b The insulation may consist of rubber or PVC.	

Compliance is checked by inspection and measurement.

The nominal cross-sectional area of the conductors for lighting chains shall provide adequate current-carrying capacity and mechanical properties but shall not be less than the values in Table 2:

Table 2 – Conductor size for lighting chains

Type of lighting chain	Nominal cross-sectional area
Class II lighting chains	0,5 mm ²
Class II lighting chains with E14, E27, B15 or B22 lampholders and fitted with parallel-connected lamps	1,5 mm ²
Class III lighting chains and parts of chains supplied by SELV	0,15 mm ²
Temporarily installed protected lighting (TPL) chains	2,5 mm ²
Separate supply cables and extension cables for interconnection between different parts of extendable class II lighting chains	1,0 mm ²

Compliance is checked by inspection and measurement.

For the mechanical properties the relevant requirements given in 4.14.1 and 4.14.2 of Part 1 apply.

20.11.3 Cord anchorage test

For lighting chains incorporating a single-core cable, the test described in 5.2.10.3 of Part 1 is made in the following way.

The cable is subjected 25 times to a pull of 30 N. The torque test is not made.

For lighting chains fitted with screwless type terminals, the electrical connections are disconnected without adversely affecting the efficiency of the cord anchorage function.

20.11.4 Plugs and cable length

Lighting chains for outdoor use shall either be provided with a splash-proof plug or be suitable for permanent connection to fixed wiring by means of a junction box.

The length of the cable between the plug and the first lamp or lampholder shall be not less than 1,5 m.

Compliance is checked by measurement.

NOTE 1 National rules in some countries do not permit plugs in accordance with IEC TR 60083.

NOTE 2 In some countries (UK and Australia) national requirements are such that a plug must be fitted to a portable appliance. In situations where this plug does not provide the same ingress protection of the lighting chain, information concerning the location of the plug/transformer may be given e.g. "Plug/transformer for indoor use only".

20.11.5 Maximum length of extendable class II lighting chains

Extendable class II lighting chains shall be limited to a maximum length of:

- 100 m for systems using a 0,5 mm² cable;
- 150 m for systems using a 0,75 mm² cable.

Compliance is checked by inspection and measurement.

20.12 Protection against electric shock

20.12.1 General

The provisions of Section 8 of Part 1 apply together with the requirements of 20.12.2 to 20.12.5.

20.12.2 Divisible plug

If the plug of a lighting chain incorporates a means for disconnecting one end of the chain to facilitate installation, the connector fitted at the end of the cable shall have an entry such that the diameter of the opening and the distance from the front to live parts are equal to the corresponding dimensions specified in Figure 2. The two parts of the connector shall not separate when subjected to a pull force of 10 N.

Dimensions in millimetres

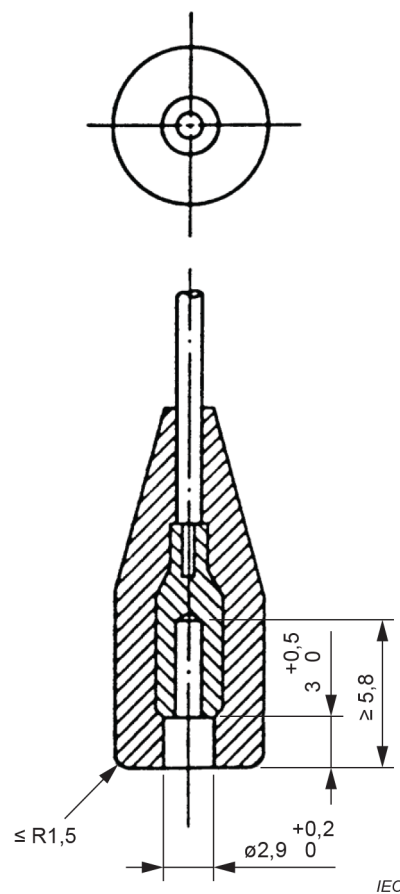


Figure 2 – Example of a connector to a divisible plug for lighting chains

Compliance is checked by a test with the standard test finger specified in IEC 60529.

20.12.3 Electrification of decorations

Lighting chains shall not electrify tinsel or other metallic decorations with which they are used.

Compliance shall be checked by means of a flat probe, 0,5 mm thick and 8 mm wide, with a rounded tip having a radius of 4 mm. It shall not be possible to touch live parts with this probe, when it is applied in any position with a force not exceeding 0,5 N, the chain being fitted with the lamps with which it is delivered.

20.12.4 Contacts of push-in lampholders

Lampholder contacts in push-in lampholders shall be reliably secured in the lampholder body by means other than friction to avoid a displacement of the lampholder contacts such that live parts of the chain become accessible either through the bottom or top of the lampholder.

NOTE An example of an adequate securing method is by the provision of ears on the contacts of the lampholder.

Compliance is checked by inspection and by the following test.

Six lampholders are heated for 7 h according to the requirements of Clause 12.3 of Part 1 in an orientation to reach the highest temperature. After the lampholders have cooled down to room temperature, the lamps are removed and a force of 15 N is applied for 1 min to each of the conductors connected. Following this, a force of 30 N is applied for 1 min to the two conductors together. The forces are applied at a distance of $3 \text{ mm} \pm 0,8 \text{ mm}$ from the insertion points in the lampholder so as to try to move the contacts from the lampholders.

During the test the contacts shall not move more than 0,8 mm. An example of a device suitable for this test is shown in Figure 3.

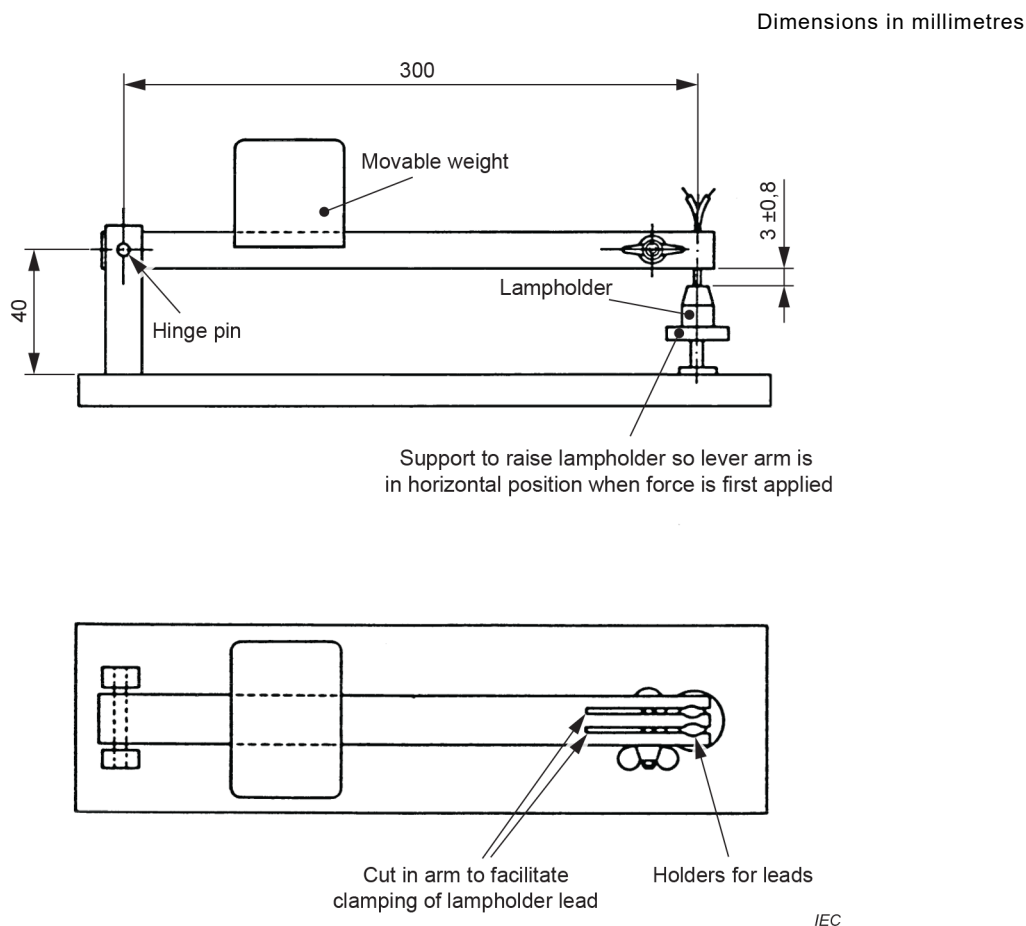


Figure 3 – Example of test device suitable for checking security of lampholder contacts

20.12.5 Blanking plugs

Where a lighting chain is designed to be used without a lamp in every lampholder, suitable blanking plug(s) shall be provided to prevent access to live parts.

20.13 Endurance tests and thermal tests

20.13.1 General

The provisions of Section 12 of Part 1 apply together with the requirements of 20.13.2 to 20.13.3.

Lighting chains with an IP classification greater than IPX0 shall be subjected to the relevant tests of Clauses 12.4, 12.5 and 12.6 of Part 1 after the test(s) of Clause 9.2 but before the test(s) of Clause 9.3 of Part 1 specified in Clause 20.14 of this document.

20.13.2 Test voltage

The provisions of 12.3.1 d) of Part 1 together with the following apply.

For class III chains supplied from an associated transformer/convertor, the test is carried out at 1,10 times the rated voltage of the transformer/convertor.

The provisions of 12.4.1 d) of Part 1 together with the following apply.

For class III chains supplied from an associated transformer/convertor, the test is carried out at 1,06 times the rated voltage of the transformer/convertor.

20.13.3 Lamp bridging devices

The operation of devices for bridging the lamp filament, where fitted in accordance with 20.7.7, shall not cause any part of the lighting chain to attain a temperature which would impair safety.

Compliance is checked by causing the bridging device to operate successively on each lamp until the complete set falls or until half the chain is bridged, whichever occurs first. The lamps are not replaced during the test. The temperature of the component parts of the lighting chain shall be allowed to stabilize before each bridging device is made to operate. The temperature of lampholders and cables shall not exceed the appropriate values given in Tables 12.1 and 12.2 of Part 1 and eventual deformation shall not give access to live parts.

If a protective device (e.g. a 'fuse' lamp) operates during the test, the highest temperatures reached shall be taken as the final temperatures.

20.13.4 Short-circuit test of rectifier

A class II or class III LED lighting chain incorporating a rectifier unit shall be subjected to the following test.

The lighting chain is supplied with a voltage between 0,9 and 1,1 times the rated supply voltage. The output of the rectifier is short-circuited. During this test there shall be no emission of flames or molten material or production of flammable gases. Live parts shall not become accessible.

Compliance: To check whether emission of flames or molten material might present a safety hazard, the test specimen is wrapped with a tissue paper, as specified in 4.187 of ISO 4046-4:2016, and shall not ignite.

20.14 Resistance to dust, solid objects and moisture

The provisions of Section 9 of Part 1 apply together with the following requirement. For lighting chains with an IP classification greater than IP20, the order of the tests specified in Section 12 of Part 1 shall be as specified in Clause 20.13 of this document.

During the test the lighting chains are completely assembled ready for use, appropriate lamps are inserted and the lampholders are positioned at random.

20.15 Insulation resistance and electric strength

The provisions of Section 9 of Part 1 apply together with the following.

During the measurement of the insulation resistance and the electric strength test the following procedure applies:

- for lighting chains for outdoor use, the metal foil shall be completely wrapped over the lampholder and the lamp;
- for lighting chains for indoor use with Edison screw lampholders tested according to IEC 60238, or bayonet lampholders tested according to IEC 61184, the metal foil is only wrapped on the lampholder near to the rim of the lampholder, but the lamp is not wrapped with metal foil;
- for lighting chains with push-in lampholders, the metal foil shall be completely wrapped over the lampholder and the lamp.

20.16 Resistance to heat, fire and tracking

The provisions of Section 13 of Part 1 apply, except that:

- for Edison lampholders, the tests of Clause 13 are replaced by the tests of Clause 21 of IEC 60238:2016 and IEC 60238:2016/AMD2:2020 and for Bayonet lampholders the tests are replaced by the tests of Clause 20 of IEC 61184:2017 and IEC 61184:2017/AMD1:2019.

Annex A (normative)

Requirements for interconnecting connectors for use in lighting chains

Annex A consists of relevant modifications to IEC 61984 to cover interconnecting connectors used in lighting chains. Only the subclauses of IEC 61984:2008 referred to in this annex, including indicated changes, apply for the interconnecting devices in question.

This annex covers connectors for both class II and class III lighting chains, although the scope of IEC 61984 is limited to connectors > 50 V only.

5.2 Classification according to protection against electric shock

Only enclosed connectors are accepted.

5.3 Classification according to the style of connector

Only free connectors are considered in this annex.

5.4 Classification according to additional characteristics of connectors

Items b), d), e), g), h) and j) apply.

NOTE The name of the manufacturer or responsible vendor and the type reference can be replaced by a code.

6.2.1 Identification

Items a) and b) apply. Other markings, if applicable, may be given in the technical documentation or catalogue of the manufacturer.

6.4.1 Non accessibility of live parts

This subclause applies for class II lighting chains only.

Compliance is checked by applying the standard test finger of IEC 60529 with a force of $20\text{ N} \pm 1\text{ N}$.

6.9.1 Polarisation

This subclause applies. In addition, there shall be no unsafe compatibility between connectors for class II and class III lighting chains of the same manufacturer. Moreover, the male part of connectors used on class III chains shall not make contact in the female part of connectors intended for use at low voltage, for example connectors complying with IEC 60320 (all parts), irrespective of compliance or not with specified standard sheets.

For manufacturer designed connectors, there shall be no unsafe compatibility with systems specified in the standard sheets of IEC 60320 (all parts) and IEC 60906 (all parts). In terms of compatibility, manufacturer designed connectors can also be subject to national requirements for the domestic plug and socket-outlet systems of the country where the lighting chain is placed on the market.

Compliance is checked by inspection and measurement.

6.9.3 Connection of conductors

Replace this subclause by the following.

The cross-sectional area of the contact making parts of the interconnecting coupler shall not be less than the cross-sectional area of the corresponding conductor in the interconnected cable.

Compliance is checked by inspection and measurement.

6.10 Design of a CBC

This subclause applies. In addition, the female part of a coupler at the end of a lighting chain, other than ordinary, shall be provided with a sealing device to ensure that the required degree of protection against dust, solid objects and moisture is achieved when the male part is not connected. This device shall be securely fixed to the coupler.

Compliance is checked by inspection.

6.13 Dielectric strength

This test is replaced by the test of Clause 20.15 of this document.

During the measurement of the insulation resistance and the electric strength test, the coupler shall be completely wrapped in metal foil.

6.14.2 Electrical endurance (CBC)

This test applies and the number of cycles shall be 50.

Compliance is checked by the test of 7.3.5 of IEC 61984:2008.

6.14.3 Bendings (non-rewirable connectors)

This test applies and the number of cycles shall be 1 000.

Compliance is checked by the test of 7.3.10 of IEC 61984:2008.

6.17 Cable clamp

This test is replaced by the test of 20.11.3 of this document.

Bibliography

IEC 60050-581, *International Electrotechnical Vocabulary (IEV) – Part 581: Electromechanical components for electronic equipment* (available at <http://www.electropedia.org>)

IEC TR 60083, *Plugs and socket-outlets for domestic and similar general use standardized in member countries of IEC*

IEC 60598-2-4, *Luminaires – Part 2-4: Particular requirements – Portable general purpose luminaires*

IEC 60598-2-21, *Particular requirements – Rope lights*

[*\(Continued from second cover\)*](#)

In this adopted standard, reference appears to International Standards for which Indian Standards also exists. The corresponding Indian Standards, which are to be substituted, are listed below along with their degree of equivalence for the editions indicated:

<i>International Standard</i>	<i>Corresponding Indian Standard</i>	<i>Degree of Equivalence</i>
IEC 60238 : 2016 Edison screw lampholders	IS 10276 (Part 1) : 2024/IEC 60238 : 2016 Edison screw lampholders (<i>first revision</i>)	Identical
IEC 60309-1 Plugs, socket-outlets and couplers for industrial purposes — Part 1: General requirements	IS/IEC 60309-1 : 2021 Plugs, fixed or portable socket-outlets and appliance inlets for industrial purposes: Part 1 General requirements (<i>second revision</i>)	Identical
IEC 60529 Degrees of protection provided by enclosures (IP code)	IS/IEC 60529 : 2001 Degrees of protection provided by enclosures (IP code)	Identical
IEC 60598-1 Luminaires — Part 1: General requirements and tests	IS 10322 (Part 1) : 2026 Luminaires: Part 1 General requirements and tests (<i>second revision</i>) (IEC 60958-1 : 2024, MOD)	Modified
IEC 61184 : 2017 Bayonet lampholders	IS 1258 : 2024/IEC 61184 : 2017 Bayonet lamp holders (<i>fifth revision</i>)	Identical
IEC 61347-2-13 Lamp controlgear — Part 2-13: Particular requirements for d.c. or a.c. supplied electronic controlgear for LED modules	IS 15885 (Part 2/Sec 13) : 2012 Safety of lamp controlgear: Part 2 Particular requirements, Section 13 d.c. or a.c. supplied electronic controlgear for led modules	Technically Equivalent
IEC 61984 : 2008 Connectors — Safety requirements and tests	IS 16781 : 2018/IEC 62852 : 2014 Connectors for d.c. application in photovoltaic systems safety requirements and tests	Identical
ISO 4046-4 : 2016 Paper, board, pulps and related terms — Vocabulary — Part 4: Paper and board grades and converted products	IS 4661 (Part 4) : 2022/ISO 4046-4 : 2016 Paper, board, pulps and related terms — Vocabulary — Part 4: Paper and board grades and converted products	Identical

The technical committee has reviewed the provision of the following International Standard referred in this adopted standard and has decided that it is acceptable for use in conjunction with this standard:

<i>International Standard</i>	<i>Title</i>
IEC 60320 (all parts)	Appliance couplers for household and similar general purposes
IEC 60906 (all parts)	IEC system of plugs and socket-outlets for household and similar purposes
IEC 61347-2-11	Lamp controlgear — Part 2-11: Particular requirements for miscellaneous electronic circuits used with luminaires

Only English language text has been retained while adopting it in this Indian Standard, and as such the page numbers given here are not the same as in the International Standard.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated expressing the result of a test, shall be rounded off in accordance with IS 2: 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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